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Prospective memory, level of disability, and return to work in severe mental illness

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Abstract

Objective: Prospective memory (the ability to remember to do things) has clear implications for everyday functioning, including employment, in people with severe mental illnesses (SMI). This study aimed to evaluate prospective memory performance and its relationship to real-world functional variables in an employment-seeking sample of people with SMI (Clinical Trial registration number NCT00895258).

Method: 153 individuals with DSM-IV diagnosis of depression (n=58), bipolar disorder (n=37), or schizophrenia (n=58) who were receiving outpatient psychiatric care at a university clinic enrolled in a trial of supported employment and completed a baseline assessment. Prospective memory was measured with the Memory for Intentions Test (MIST); real-world functional status included work history variables, clinical history variables, baseline functional capacity (UCSD Performance-based Skills Assessment-Brief), and work outcomes (weeks worked and wages earned during two years of supported employment).

Results: Participants with schizophrenia performed worse on the MIST than did those with affective disorders. Independent of diagnosis, education, and estimated intellectual functioning, prospective memory significantly predicted variance in measures of disability and illness burden (disability benefits, hospitalization history, current functional capacity), and work outcomes over two years of supported employment (weeks worked).

Conclusions: Worse prospective memory appears to be associated with greater illness burden and functional disability in SMI. Mental health clinicians and employment specialists may counsel

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clients to use compensatory prospective memory strategies to improve work performance and decrease functional disability associated with SMI.

Keywords

episodic memory; everyday functioning; supported employment; schizophrenia

Introduction

Cognitive impairment is a leading cause of functional disability in people with severe mental illness (SMI; schizophrenia/schizoaffective disorder, bipolar disorder, or major depressive disorder), and often negatively affects everyday functioning more so than do psychiatric symptoms (Green, Kern, Braff, & Mintz, 2000; Velligan et al., 1997). These stable, enduring deficits are therefore considered a rate-limiting step in functional recovery from psychiatric illness. Specifically, there is evidence to suggest that the cognitive deficits common in SMI (e.g., impaired attention, working memory, processing speed, learning, executive functioning) interfere with obtaining and maintaining employment (Bearden et al., 2011; Gilbert & Marwaha, 2013; McGurk & Mueser, 2004). Evidence-based vocational rehabilitation programs like supported employment (Becker & Drake, 2003) are increasingly incorporating cognitive remediation paradigms to expressly address these prevalent cognitive deficits and improve work-related outcomes (McGurk et al., 2015).

One cognitive construct with particularly clear implications for everyday functioning is prospective memory, or remembering to remember. Prospective memory is a complex aspect of episodic memory that is conceptualized to involve four stages (Carey et al., 2006; Knight, 1998): (1) intention formation, or encoding the intention and its corresponding action (e.g., telling oneself to stop by the pharmacy on the way home from work), (2) delay maintenance interval, or retaining the intention during unrelated activities (e.g., spending the day at work), (3) self-initiated cue recognition and intention retrieval, or recognizing an internal or external cue and retrieving the appropriate response (e.g., leaving work or passing by the pharmacy), and (4) intention execution, or performing the intended response (e.g., pick up prescription at the pharmacy). Because retrieval of the intention must be self-initiated (stage 3), some theorists contend that this is the defining feature of prospective memory and what sets it apart from conventional recall tasks in which an external source, often an experimenter, prompts for a response (Knight, 1998). Previous research demonstrated that, among individuals with primary psychotic illness, prospective memory was related to learning but not delayed recall, suggesting that it is a distinct aspect of episodic memory unrelated to retrospective memory (Twamley et al., 2008). Numerous studies have demonstrated prospective memory impairment among individuals with psychiatric illness. Individuals with schizophrenia exhibit a general deficit in both time- and event-based prospective memory tasks; there is some evidence that these participants demonstrate greater difficulty with time-based tasks, though there is considerable variability in the published literature (Ordemann, Opper, & Davalos, 2014). In addition, neither chronicity of illness nor medication effects appear to explain such deficits (Ordemann, Opper, & Davalos, 2014). Similar deficits have been found among individuals with bipolar disorder (Au et al., 2016; Chan et al., 2012) and major depressive disorder (Altgassen, Kliegel, & Martin, 2009; Rude

et al., 1999). Further, worse prospective memory has been shown to correspond to poorer community skills and functioning assessed in the laboratory. Specifically, Au and colleagues demonstrated that impaired prospective memory was related to lower scores on the community living skills subscale of the Functional Needs Assessment among individuals with schizophrenia (2014) and bipolar disorder (2013). Other studies including those with schizophrenia-spectrum disorders found that poorer prospective memory was related to poorer functional skills like financial management and communication (Twamley et al., 2008) as well as medication management (Raskin et al., 2013).

Similarly, prospective memory dysfunction has clear implications for employment success for people with severe mental illness; for example, employees must remember to complete assigned tasks, submit a time card, attend a scheduled meeting, etc. The relationship between prospective memory and employment in particular, however, has rarely been reported. Woods and colleagues (2011) demonstrated that, among HIV-infected individuals, those who were unemployed performed significantly worse on a standardized measure of prospective memory, and were particularly prone to errors of omission. Moreover, in this sample prospective memory was a unique predictor of unemployment when considered among other neuropsychological variables, adding to its incremental value as a separate cognitive predictor of everyday functioning (Woods et al., 2011). Despite the fact that occupational status is considered an integral part of psychosocial functioning and recovery, to date we are unaware of any other published studies investigating the relationship between prospective memory and employment in clinical samples.

Given the lack of published literature in this area, we aimed to evaluate prospective memory performance in an employment-seeking sample of individuals with SMI and its relationship to real-world functional variables, including employment outcomes. We hypothesized that poorer prospective memory performance would be related to greater disability (as measured by work history, clinical variables, and functional capacity performance) and poorer employment outcomes among participants in a supported employment program.

Method

Participants

Between April 2008 and April 2013, 153 individuals who were receiving outpatient psychiatric care at a university clinic and who were referred for vocational services enrolled in a randomized controlled trial of supported employment with or without Compensatory Cognitive Training (Twamley et al., 2012, 2017). The study was approved by the UCSD Institutional Review Board and was registered as a clinical trial as legislation requires (Clinical Trial registration number NCT00895258); all participants provided written informed consent at the time of enrollment. On average, participants were 44 years old and had completed 13.5 years of education; the majority of the sample were male and White (Table 1). Fifty-eight participants were diagnosed with schizophrenia/schizoaffective disorder, 37 were diagnosed with bipolar disorder, and 58 were diagnosed with major depressive disorder.

Procedures

Potential participants were referred to the study by treating clinicians or self-referral for vocational services. Following enrollment, participants' diagnoses were confirmed using the Mini International Neuropsychiatric Interview (Sheehan et al., 1998). Inclusion criteria were: (a) unemployed for at least 30 days, (b) DSM-IV diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, or major depressive disorder, and (c) unemployed and stating a current goal of employment. Candidates were excluded if they were not primarily English-speaking (n=1), had a history of neurological disease or injury (n=29), had a concurrent diagnosis of intellectual disability (n=1), or met criteria for current alcohol or substance abuse or dependence (n=5). Participants were provided Individual Placement and Support, the manualized version of supported employment. Supported employment is the gold-standard evidence-based intervention for vocational rehabilitation, and emphasizes rapid job searching and placement in competitive work settings (i.e., jobs that pay at least minimum wage and are not set aside for individuals with disabilities), unlimited follow-along job support, and integrated collaboration between the employment specialist and other mental health providers. The current analyses used data only from the baseline neuropsychological, clinical, and functional assessment. Employment data including weeks worked and wages earned were collected weekly for the duration of the two-year study.

Measures

The reading subtest of the Wide Range Achievement Test, third edition (WRAT-3; Wilkinson, 1993) was used as an estimate of premorbid verbal intellectual functioning. Prospective memory was measured with the Memory for Intentions Test (MIST; Raskin, Buckheit, & Sherrod, 2010). This standardized measure is administered over a 30-minute period during which examinees respond to various cues provided by the examiner (e.g., "In 15 minutes, please tell me that it is time to take a break"; "When I hand you a red pen, please sign your name on your paper") while they work on a distracter word-search puzzle. There are eight trials divided evenly between 2- and 15-minute cues, time- and event-based cues, and verbal and action responses. A total of 6 points is possible for each trial, with a maximum score of 48; higher scores indicate better prospective memory. In addition to the overall accuracy score, error types are also recorded (e.g., no response, task substitution, loss of content, loss of time) and a multiple-choice recognition test is included to probe recall for missed trials.

Measurement of real-world functional status included work history variables collected via self-report at study entry (i.e., percentage of years employed in adulthood, number of months worked in the past five years, amount of monthly disability entitlement in US dollars), clinical history variables also self-reported by participants (i.e., number of psychiatric hospitalizations, number of months hospitalized during lifetime), baseline functional capacity as measured by role play tasks of communication and financial ability (total score on the UCSD Performance Based Skills Assessment, brief version [UPSA-B; Mausbach et al., 2007]), and employment outcome variables (number of weeks of competitive work and wages earned in US dollars during the two years of supported employment services).

Analyses

All variables were normally distributed, except for number of hospitalizations, number of months hospitalized, and wages earned, which were all positively skewed and leptokurtic. Log transformed variables were computed and resulted in normal distributions for these variables, so they were included in further analyses and are reported in the results.

Descriptive analyses included paired t-tests comparing all participants' performance on the MIST task types (raw scores on time- versus event-based items, 2- versus 15-minute delays, and action versus verbal responses). Differences in MIST performance among the SMI diagnostic groups were evaluated with Multivariate Analysis of Variance (MANOVA). Diagnostic group was included as the independent variable with three levels (schizophrenia/schizoaffective disorder, bipolar disorder, and major depressive disorder). MANOVA was selected to reduce the experiment-wise Type I error rate as well as to take into account the high intercorrelations among the MIST dependent variables (Table 2); examination of the correlation matrix suggested that the MIST variables could be separated into task type and error type. Because these groupings were considered theoretically sound as well, two MANOVAs were conducted: diagnostic differences by task type (raw scores on time cues, event cues, 2-minute delay cues, 15-minute delay cues, action responses, verbal responses, and the summary score) and diagnostic differences by error type (percentage of total errors that were no response errors, task substitution errors, loss of content errors, and loss of time errors).

The diagnostic groups differed in premorbid IQ estimate and education level (see Table 1). Simultaneous regression was used to predict variance in each real-world functional status variable, and included the following predictors: SMI diagnostic group (as an ordinal variable with MDD=1; BAD=2, and SZ/SAD=3), years of education, WRAT-3 Reading standard score, and MIST summary score. Data were analyzed using SPSS (Version 21); alpha for significance was set at 0.05.

Results

Descriptive MIST performance in the full sample

On average, participants scored 35 out of 48 points on the MIST (range 3–48; median=36). Based on the MIST standardization sample (Raskin et al., 2010), the median age- and education-corrected summary score percentile for these participants was 46 (range 1–99). Participants scored significantly higher on event-based cues versus time-based cues (M=6.45, SD=1.96 versus M=5.16, SD=1.85; t=−8.11; df=152; p<.001; r=0.47), 2-minute versus 15-minute delays (M=6.92, SD=1.68 versus M=4.69, SD=2.08; t=14.41; df=152; p<.001; r=0.50), and on verbal responses versus action responses (M=6.11, SD=1.89 versus M=5.50, SD=1.85; t=4.13; df=152; p<.001; r=0.52). Task substitution errors were the most common (34%), followed by loss of content (23%), no response (21%), and loss of time errors (15%); see Table 3.

Differences among SMI diagnostic groups

Descriptive statistics of MIST performance by diagnostic group are reported in Table 3. The overall MANOVA model including the seven MIST task type dependent variables was significant (Wilks' Lambda=.86; F(8, 294)=2.98; p=0.003). The overall MANOVA model including the four MIST error type dependent variables was not significant (Wilks' Lambda=.94; F(8, 294)=1.26; p=0.264).

Relationships between MIST performance and real-world functional status

Accounting for SMI diagnostic group and two estimates of premorbid ability (education and reading score), MIST summary score significantly predicted variance in amount of disability entitlement, months hospitalized, UPSA-B total score, and weeks worked over two years of supported employment (semi-partial correlations ranging from −.26 to .18; Table 4). MIST summary score was not a significant predictor of variance in percent years employed in adulthood, months worked in the past five years, number of psychiatric hospitalizations, or wages earned.

Discussion

In general, participants in this study scored lower on the MIST summary score (35 points) than demographically similar healthy control participants from two samples (one sample scored 43 points, on average, as reported in Woods et al., 2008; the MIST normative sample similar to our sample in terms of age and education scored 39 points, on average [Raskin et al., 2010]). The general pattern of performance, however, was similar between this psychiatric sample and the healthy participants previously reported, in that respondents scored higher on event-based versus time-based cues, items with briefer versus longer delay, and verbal versus action response. These findings are consistent with the idea that event-based prospective memory tasks may be more likely to be externally cued and therefore less reliant on continuous strategic monitoring like time-based tasks, and are possibly less sensitive to disruption in cognitive disorders (Einstein & McDaniel, 1990). It is also notable that participants made more task substitution errors than no response errors, which may suggest a deficit in attention or maintaining set rather than prospective memory per se; additional investigation is warranted to parse these potential relationships. Moreover, in comparison to the primary affective diagnostic groups, participants with schizophrenia demonstrated worse performance on several MIST subscales, which may reflect greater generalized cognitive impairment in schizophrenia and/or greater severity of negative symptoms or deficit syndrome. Schizophrenia participants also scored lower than those with bipolar disorder and major depression on a measure of estimated premorbid IQ; this is consistent with other findings suggesting a mild decrement in IQ among those with primary psychotic disorders, though the difference of about 7 points is not likely to be clinically significant, and was also accounted for in the regression analyses.

The present findings may have practical significance for mental health clinicians and employment specialists who work with clients diagnosed with SMI; in particular, instruction and coaching in compensatory prospective memory strategies may improve work performance and decrease functional disability associated with SMI. For example, clients

could be counselled to link new activities to existing events rather than time cues (e.g., the weekly staff meeting occurs immediately after lunch, or the report is due at the same time as the monthly timecard). General prospective memory strategies, such as calendars and to-do lists, are also likely to be helpful.

Not only does prospective memory performance appear to be negatively affected in SMI, these results also suggest that it is associated with measures of illness burden and functional disability. Specifically, we found that worse prospective memory performance was associated with higher amounts of disability entitlements, more months hospitalized, worse current functional capacity, and worse employment outcome measured prospectively (weeks worked during two years of supported employment services). It is noteworthy that MIST performance did not significantly predict variance in work in the past five years, though it did predict variance in work obtained during the study. It is possible that prospective memory influenced participants' ability to fully engage in or benefit from the supported employment intervention; further investigation into these relationships is warranted. Importantly, prospective memory uniquely predicted variance in these real-world functioning variables, beyond potential confounding factors like educational attainment and premorbid intellectual functioning. These findings implicate prospective memory, likely in addition to other relevant cognitive abilities, in the functional deterioration and chronic disability often observed among those with SMI.

There are limitations of the study worth considering. First, neuropsychological variables other than prospective memory (e.g., verbal learning, executive functioning) were not included in these analyses, so their relative contribution to real-world functional status remains unknown; future analyses will include these neuropsychological variables as well as other predictors of work outcomes. Also, the cross-sectional nature of these analyses prevents conclusions regarding causality (e.g., current prospective memory is associated with indices of illness history, but a causal relationship cannot be determined). Furthermore, participants were unemployed, community-dwelling outpatients with SMI who self-selected into a supported employment research study, which may limit generalizability to other samples. Similarly, because this intervention study was designed for individuals with psychiatric illness, there were no healthy control participants to enable comparisons between groups on MIST performance. Moreover, we acknowledge that return to work as an outcome variable is complex and determined by a multitude of factors including local economy and availability of appropriate jobs, logistics such as transportation and childcare, race and gender, etc. Finally, we did not measure performance at the worksite, but future research could address the relationship between prospective memory and work performance. Nevertheless, these analyses augment the limited existing literature on the relationship between prospective memory and employment, and provide support for the real-world relevance of this cognitive domain and its potential for remediation in the course of vocational rehabilitation.

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Table 1.

Demographic and Clinical Features of the Full Sample and Diagnostic Groups

	Full Sample (n=153)	SZ (n=58)	BAD (n=37)	MDD (n=58)	Group Differences			
Variable	**Mean (sd) or %**	**Mean (sd) or %**	**Mean (sd) or %**	**Mean (sd) or %**	**F or χ^2**	**df**	**p**	**Pairwise Comparison**
Age, years	43.7 (11.7)	41.7 (11.8)	44.8 (11.2)	45.1 (11.8)	1.44	2	.240	
Education, years	13.5 (2.8)	12.6 (2.8)	14.2 (2.4)	13.8 (2.8)	4.91	2	**.009**	SZ<MDD/BAD
WRAT-3 Reading standard score	103.0 (9.7)	99.1 (10.6)	106.5 (8.0)	104.6 (8.4)	8.70	2	**<.001**	SZ<MDD/BAD
Male, %	57	71	60	41	10.29	2	**.006**	
White, %	81	64	95	90	22.05	6	**.001**	
Hispanic ethnicity, %	20	24	8	24	4.46	2	.107	
Taking antipsychotic medication, %	46	85	31	8	81.27	2	**<.001**	
Taking mood stabilizer medication, %	23	17	57	6	34.80	2	**<.001**	
Taking antidepressant medication, %	60	45	49	84	21.55	2	**<.001**	
History of substance use disorder, %	69	65	81	64	3.23	2	.199	
Living independently, %	91	85	97	93	5.03	2	.081	
Never married, %	66	62	41	47	1.91	2	.385	

Note. BAD=bipolar affective disorder; MDD=major depressive disorder; SZ=schizophrenia or schizoaffective disorder; WRAT-3=Wide Range Achievement Test, third edition.

Table 2.

MIST Correlation Matrix (n=153)

	Time cues	Event cues	2-minute cues	15-minute cues	Verbal responses	Action responses	Summary score	No response errors	Task substitution errors	Loss of content errors	Loss of time errors
	1										
Event cues	**.47**	1									
2-minute cues	**.72**	**.71**	1								
15-minute cues	**.75**	**.78**	**.50**	1							
Verbal responses	**.89**	**.62**	**.88**	**.66**	1						
Action responses	**.59**	**.89**	**.57**	**.90**	**.52**	1					
Summary score	**.85**	**.87**	**.83**	**.89**	**.87**	**.87**	1				
No response errors	**−.48**	−.02	**−.22**	**−.27**	**−.36**	−.13	**−.28**	1			
Task substitution errors	.13	−.12	−.02	.02	.07	−.06	.01	**−.47**	1		
Loss of content errors	.03	−.01	.06	−.03	.05	−.03	.01	−.16	**−.36**	1	
Loss of time errors	−.07	.03	.06	−.09	.01	−.05	−.02	−.18 *	−.13	**−.28**	1

Note. Bold font = p<.01;

* =p<.05

Table 3.

Descriptive MIST Performance for the Full Sample and by Diagnostic Group

	Mean (sd)			
	Full Sample (n=153)	**SZ (n=58)**	**BAD (n=37)**	**MDD (n=58)**
Time cues	5.2 (1.9)	4.3 (2.0)	5.8 (1.6)	5.6 (1.5)
Event cues	6.5 (2.0)	6.2 (2.0)	6.9 (1.9)	6.4 (2.0)
2-minute cues	6.9 (1.7)	6.4 (1.9)	7.4 (1.3)	7.1 (1.5)
15-minute cues	4.7 (2.1)	4.1 (1.9)	5.3 (2.1)	4.9 (2.1)
Verbal responses	6.1 (1.9)	5.4 (2.1)	6.8 (1.5)	6.4 (1.7)
Action responses	5.5 (1.9)	5.1 (1.8)	5.9 (1.8)	5.6 (1.9)
Summary score	34.8 (9.8)	31.6 (9.9)	38.0 (9.1)	36.1 (9.3)
No response errors, %	20.6 (28.7)	27.9 (30.3)	17.0 (30.2)	15.6 (24.7)
Task substitution errors, %	34.2 (33.9)	31.3 (31.3)	36.3 (37.4)	35.7 (34.4)
Loss of content errors, %	22.6 (28.5)	23.9 (24.0)	23.3 (31.5)	21.0 (30.9)
Loss of time errors, %	15.4 (22.4)	14.6 (21.9)	12.2 (19.4)	18.1 (24.7)

Note. BAD=bipolar affective disorder; MDD=major depressive disorder; SZ=schizophrenia or schizoaffective disorder

Table 4.

Simultaneous Regressions Predicting Real-World Functional Status (n=153)

Variable				
Employment History				
Percent of years employed in adulthood	F	df	*p*	R square
Full model	16.07	4	**<.001**	.31
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	−0.25	−3.39	**.001**	−.24
Years of education	0.41	5.41	**<.001**	.37
WRAT-3 Reading standard score	−0.01	−0.09	.925	−.01
MIST summary score	0.14	1.95	.054	.14
Months worked in past 5 years	F	df	*p*	R square
Full model	6.54	4	**<.001**	.15
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	−0.12	−1.51	.135	−.12
Years of education	0.31	3.78	**<.001**	.29
WRAT-3 Reading standard score	−0.03	−0.38	.705	−.03
MIST summary score	0.14	1.73	.085	.13
Monthly disability entitlement in US dollars	F	df	*p*	R square
Full model	2.33	4	.060	.07
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	0.12	1.36	.176	.12
Years of education	−0.05	−0.51	.610	−.04
WRAT-3 Reading standard score	0.01	0.06	.950	.01
MIST summary score	−0.20	−2.22	**.028**	−.19
Clinical History				
Number of psychiatric hospitalizations (log transformed)	F	df	*p*	R square
Full model	2.92	4	**.025**	.11
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	0.19	1.88	.064	.19

Variable				
Years of education	−0.11	−1.04	.303	−.10
WRAT-3 Reading standard score	−0.02	−0.18	.854	−.02
MIST summary score	−0.19	−1.77	.080	−.18
Months hospitalized (log transformed)	F	df	*p*	R square
Full model	7.28	4	**<.001**	.24
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	0.21	2.24	**.028**	.20
Years of education	−0.09	−0.97	.334	−.09
WRAT-3 Reading standard score	−0.17	−1.71	.091	−.16
MIST summary score	−0.28	−2.85	**.005**	−.26
Current Functional Capacity				
UPSA-B total score	F	df	*p*	R square
Full model	17.81	4	**<.001**	.33
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	−0.35	−4.88	**<.001**	−.33
Years of education	0.12	1.67	.097	.11
WRAT-3 Reading standard score	0.20	2.62	**.010**	.18
MIST summary score	0.18	2.60	**.010**	.18
Two-year Employment Outcomes				
Weeks worked (n=136)	F	df	*p*	R square
Full model	2.83	4	**.027**	.08
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation
SMI diagnostic group	−0.11	−1.24	.219	−.10
Years of education	0.07	0.77	.445	.06
WRAT-3 Reading standard score	−0.01	−0.15	.880	−.010
MIST summary score	0.23	2.56	**.012**	.214
Wages earned (log transformed) (n=72)	F	df	*p*	R square
Full model	0.82	4	.516	.05
Individual predictors	standardizedβ	*t*	*p*	Semi-partial correlation

Variable				
SMI diagnostic group	−0.13	−1.05	.299	−.13
Years of education	−0.09	−0.73	.469	−.09
WRAT-3 Reading standard score	0.01	0.05	.962	.01
MIST summary score	0.14	1.14	.258	.14

Note. n = 153. Significant differences are indicated in bold font. MIST=Memory for Intentions Test; SMI=severe mental illness; UPSA-B=UCSD Performance Based Skills Assessment, brief version; WRAT-3=Wide Range Achievement Test, third edition